DEPARTMENT OF DEFENSE

JOINT
DEMILITARIZATION TECHNOLOGY
PROGRAM

OCTOBER 2003

A REPORT TO CONGRESS

Report Documentation Page

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PREFACE

The Department of Defense (DoD) established the Joint Demilitarization Technology Program (JDTP) to develop safe, efficient, environmentally acceptable demilitarization processes for the resource recovery and recycling (R3) or other disposition of conventional ammunition, tactical missiles, rocket motors, and energetics. Strategic, tactical, and conventional weapons systems, whether excess, obsolete or unserviceable, currently fielded, or under development for future applications, require disposition planning and capability.

Direct planning and oversight of the JDTP is the responsibility of the Director of Defense Research and Engineering, who has planned current and future technology investments consistent with the *DoD Science and Technology Strategy*, and the Secretary of Defense's vision to "develop and transition superior technology to enable affordable, decisive military capability."

Accordingly, the JDTP invests in technologies selected through a decision-making process which considers current and future project investments against the relevant increase to warfighting capabilities and objectives; the reduction in military costs associated with the reduction of the stockpiles; and the potential of the technology to strengthen the industrial base, while promoting applied and advanced research for truly long term military options in this area. In turn, these planned investments support and enhance the overall quality of DoD's science and technology investments and provide DoD further flexibility to transition technology, which has the greatest impact and benefit, to the military warfighter.

To facilitate demilitarization technology transfer opportunities, the Department supports an annual *Global Demilitarization Symposium* and provides a public information website maintained by the Munitions Items Disposition Action System (MIDAS). The website address for the JDTP is http://www.dac.army.mil. The 2003 Demilitarization Symposium and Exhibition was held during 19-22 May 2003 in Sparks, Nevada. The symposium was attended by over 500 people from the U.S. and approximately 15 foreign nations. The dual sessions provided a wide variety of information on demilitarization activities including status of projects, future research and development opportunities, and plans for near term technology transitions.

Additional information on the JDTP, munitions demilitarization programs, or the Global Demilitarization Symposium may be obtained from the Joint Demilitarization Technology Office at the Defense Ammunition Center, McAlester, OK, 74501-9053, phone (918) 420-8084 or email address sjmac-td@dac.army.mil.

1-1. Introduction

On 14 August 1996, the Under Secretary of Defense (Acquisition and Technology) sent to Congress a plan for the Joint Demilitarization Technology Program (JDTP) in accordance with page 715 of the Conference Report accompanying the National Defense Authorization Act for Fiscal Year 1996 and page 218 of the House National Security Committee report accompanying the National Defense Authorization Act for Fiscal Year 1997. Following the Committee recommendation, the program plan was developed using an integrated management structure following the model of the Large Rocket Motor Demilitarization Program. Thereafter, section 227 of the National Defense Authorization Act for Fiscal Year 1997 (Public Law 104-201) required the Secretary of Defense to establish an integrated program for the development and demonstration of technologies for the demilitarization and disposal of conventional munitions, rockets, and explosives, and to submit to the Congress a report on the plan for the program. The Secretary of Defense submitted the initial program plan on 13 March 1997. Furthermore, section 227 requires an updated plan report for each fiscal year during the life of the program. The plan report submitted herein is in response to that requirement.

1-2. Background

Historically, standard techniques of removal, disassembly, incineration, or open burning/open detonation (OB/OD) were viewed as both safe and efficient. As environmental awareness increased and potential health and safety risks became known, a requirement for alternative destructive technologies and enhanced resource recovery processes began to emerge. However, since demilitarization has not been a major component of munition development and acquisition life cycle, there have been limited opportunities to support an increase in new technology development. Most new work has been done as process improvements or operations support within the guidelines of the Army's Ammunition Peculiar Equipment (APE) Program. More recently related projects have also been invested in by the Department’s broader environmental science and technology programs of the military Services, the Strategic Environmental Research and Development Program (SERDP), and the Environmental Security Technology Certification Program (ESTCP). Additionally, there have been instances where this type of work has been leveraged from the DOD/DOE Munitions program as guided by the DoD/Doe Memorandum of Understanding on Munitions.

The rationale for pursuing demilitarization technologies is driven by a variety of issues. For example, there are over 1,000 energetic fillers in the current resource recovery and disposition (RRD) inventory. The geographic dispersion and installation specific capabilities within the safety and environmental regulatory framework also drive requirements, as does the simple need to provide operators with modern safe, efficient, and economic processes. In the 1980's and the 1990's, agreements/treaties or the possibility of agreements/treaties, such as Intermediate-Range Nuclear Forces (INF), Conventional Forces

Europe (CFE), START, START II and the international movement to ban anti-personnel landmines, have also impacted technology requirements.

To characterize the stockpile the Military Services used the Munitions Items Disposition Action System (MIDAS) program. The MIDAS program forms the bridge between technology research and development and the demilitarization user community. MIDAS provides program execution support and technical assistance. The primary thrust of the program, however is to identify and characterize munitions items in direct support of resource recovery and recycling (R3) operations.

Stockpile stratification and analysis have been performed by the individual Military Services and form the basis for requirements generated by the Joint Ordnance Commander's Group (JOCG). The JOCG is a Joint Service organization consisting of flag officers who operate the U.S. munitions base. To support their analysis, the Services used the best strategy to minimize the stockpile while always considering environmental and economic factors. In short, their objectives were to reutilize excess serviceable stocks whenever possible; to reduce inventory, maintenance, surveillance and demilitarization cost; and to free up storage space. Similarly, the JDTP plan has been developed to be responsive to these principles and objectives.

The JDTP plan is responsive to near, mid, and long-term goals of the demilitarization community. Annual assessments and adjustments will occur to ensure the DOD maintains a coherent technology development strategy through the Future Years Defense Plan. The program is executed by the Joint Services with DOE, academia, and industry partnerships. The results of each project will be transitioned into the government and commercial demilitarization base to enhance safety, efficiency, and environmental acceptability in a manner that complies with all applicable environmental laws.

In response to the above challenges, the Department developed the JDTP plan to address the diversity and complexity of the current and forecasted stockpile, while meeting current environmental regulations and DOD ammunition and explosive safety standards. Beginning in Fiscal Year 2004 the program will be devolved from a defense-wide program element to a U.S. Army program element. The Army has planned to execute the program in accordance with Office of the Secretary of Defense guidance and in future years using similar approaches in prior years to balance investments across ongoing and new requirements as established by the JOCG and use of metric driven analysis to reduce stockpiled inventories.

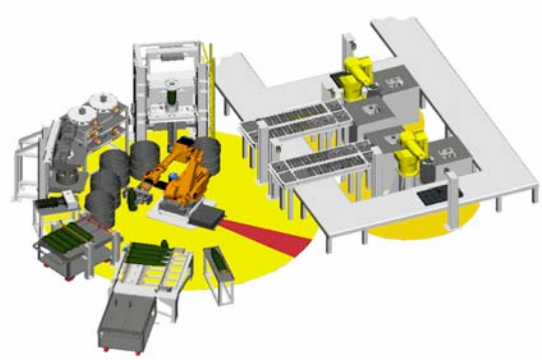
2-1. Funding ($K)

FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
16,925	18,565	9,502	10,031	10,215

2-2. Objectives and Accomplishments

The Explosive Demilitarization Technology Program is a cooperative interservice, interagency effort focused as the sole Department of Defense (DoD) program dedicated to the development of safe, efficient and environmentally acceptable processes for the resource recovery and recycling (R3) or disposition of strategic, tactical, and conventional munitions including explosives, and rocket motors. This program emphasizes the pursuit of environmentally compliant technologies to enhance existing methods for munitions R3 and treatment and seeks alternatives over that of open burning/open detonation (OB/OD). The projects are categorized into five thrust areas dealing with disassembly, removal, R3, destruction and waste stream treatment. While each project is executed, in most cases independently, there are many opportunities to integrate them into ongoing operations, existing processes or other R&D efforts.

The specific short-term goals are identified in the scope of work for each project based upon the technology maturity, operational requirements and technology application. The thrust area of disassembly is focused on mechanical disassembly automation of munitions items and advanced cutting applications to access the energetic fill or separate useful or valuable material. The removal thrust area is focused on the removal and/or separation of the energetic filler. Depending on the method employed the removal process may accomplish other beneficial tasks such as supplying the medium for recovery or putting the item in a position for further processing. The resource recovery and recycling (R3) thrust area deals with the tools necessary to facilitate the beneficial and safe reclamation of material contained in the resource recovery and disposition account (RRDA) stockpile. There are materials that are either in the account or generated during other demilitarization operations such as the disassembly and removal process that require the neutralization of energetic compounds. The thrust area of destruction address advanced destruction in environmentally benign and efficient ways. As with many industrial activities excess, unrecoverable or waste material can be generated during the demilitarization process whose ultimate disposition must be addressed. Technologies are under development to address military specific targeted waste streams in an environmentally safe manner.



Automated ADAM Projectile Disassembly Workcell

Disassembly Thrust Area

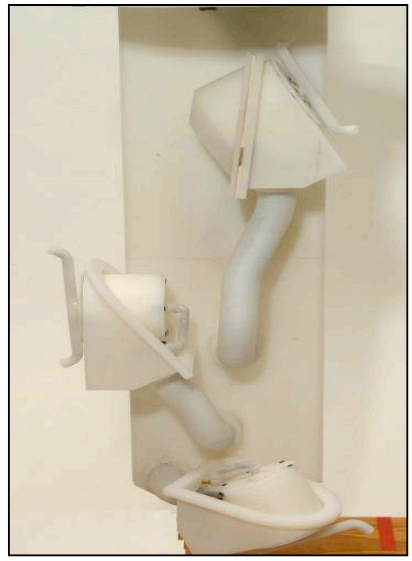
The disassembly thrust area continues to realize the goal of improving safety and increasing efficiencies across a variety of demilitarization sub systems. The automated ADAM projectile disassembly workcell has recently improved projectile handling components that safely disassemble projectiles and place each submunition layer on a conveyor leading to the mine placement sub system. Improvements in these areas have increased the overall efficiency for projectile disassembly operations and allowed increased confidence and monitoring of safety status during operations. The disassembly process allows operators to control disassembly operations from a remote location and is applicable to similar munitions with minor software and hardware modifications. The disassembly workcell has progressed through hardware design for many system component activities (e.g., removal of propellant mixtures, delay in assembly and booster press and lifting plug removal) and input station designs are now complete and will soon lead to fabrication plans. Final conveyor designs are being evaluated in consultation with the conveyor vendor. The 90% design review has been completed on the rocket motor removal station and will lead to fabrication planning activities. The booster cap and tool storage station design concepts have been completed and detailed drawings to support fabrication are in process. Projectile drilling station concepts are still under review and consideration at this time. All of the custom robot tools necessary for projectile disassembly have completed the design stage and will progress to the fabrication planning stage. The overall project has reached its 50% design and a Preliminary Hazards Assessment review has been completed for this project.

Sectioned 81mm Mortar

The disassembly thrust area also includes the advanced cutting project. This project is directed at the safe and efficient cutting of metal and explosives. Nozzle operations have been less than adequate for continuous operation for demilitarization operations. During FY 2002, modifications to the abrasive slurry system showed some improvement in operational life, but abrasive feed consistency was still not totally resolved. Four more abrasive waterjet nozzles that had been introduced for commercial use were evaluated to assess the cutting depth and effective life. The improved Ingersoll-Rand nozzle was determined to be the most efficient nozzle. Available commercial abrasives were evaluated and there was relatively little difference in the performance of garnets, providing they were properly sized before use. The performance of the abrasive waterjet nozzles was investigated and it was found that only 25% of the energy is being transferred to the garnet, suggesting that nozzle design could be significantly improved. Wear studies of existing nozzles showed focusing tubes and other critical components had significant wear. Studies have been initiated to find ways of strengthening the resistance of component materials, as well as improving design. This work will continue with the goal of identifying and developing a waterjet cutting system that will meet operational requirements.

Removal Thrust Area

The technologies in the removal thrust area are focused on improving ways to remove the energetic fillers for reclamation or further processing into valuable reusable products. There are several ways that this is accomplished including the use of autoclaves for castable explosives, water washout or hog out, and mechanical removal. Many developing technologies are focused on ways to improve upon existing removal techniques and to demonstrating increased efficiencies that eliminate or reduce waste streams of hazardous materials. The high-pressure washout of HC 1.1 Solid Rocket Motors is a spin-off of a similar system for HC 1.3 propellant. Due to the physical and chemical differences between the HC 1.1 propellant and the HC 1.3 propellant, higher-pressures are required along with modified operational procedures in order to control trace amounts of nitroglycerin by products. Recent development efforts have included improvements in major pieces of tooling equipment such as the loaded motor rotary table, the water cutter heads, the articulating arm fixture, the vertical drive unit, and the washout tower. When complete, this project will provide the capability to recover the energetic materials while avoiding the open burning of the rocket motor.



Cutter Head Articulating Fixture and Cutter Assembly

Another project under the removal thrust area is the induction heating project. The scope of this project is to quickly remove cast explosives from high explosive loaded projectiles, thus enabling recovery of the explosives and providing for decontamination of the projectile. Progress to date includes demonstration and development of time studies for the removal of Comp B loaded 60mm mortar rounds and 81mm TNT loaded mortars. Process enhancements have been identified that will increase proposed production rates for these materials and has led to the identification of new candidate materials like larger TNT and Comp B loaded projectiles. This project, if successful, will generate less waste overall (including hazardous waste) than current methods.

TNT Slug from Induction Heating

R3 thrust Area

The resource recovery and recycling (R3) thrust area consists of technology development projects that enhance the departments' ability to safely, efficiently, and beneficially recover useful material from excess, obsolete, or unserviceable munition items.

Projects, such as the propellant stability analyzers, address safety concerns with recovered propellant that in the future can be expanded to other energetic components. Some of the projects explore opportunities for using the existing material in new or existing commercial or military applications, while other projects may use existing material as a feedstock for other products such as fertilizer. The following projects address these goals and are demonstrating satisfactory progress.

The near IR field propellant stabilizer-screening instrument has obtained unanimous approval for use as intended from the Propellant Surveillance Safety Board. The instrument has completed the transition into the Ammunition Peculiar Equipment (APE) program. Ongoing work includes development of calibration models for additional formulations, including IMR, WC, and Navy types SPD (Pyrocellulose), SPCF (BS-NACO), SPCG (triple base), and SPDN. The latter is similar to M1 and M6; suitability for incorporation into either of those existing models will be explored. Accelerated aging, which has been used successfully to increase the stabilizer range of available M8 propellant, will be expanded to cover type M9 and M10. A broad range of stabilizer levels is required to build reliable calibration models. Efforts to improve the operation and equipment will continue with the addition of other formulations. These additions will increase the safety factors associated with the recovery of propellants and explosives during demilitarization operations. Currently this material is sent to storage without knowing its existing condition. Knowing the existing condition of the propellant enables informed decision making for determining further recovery methods and alternatives. Paramount among this review is assessing whether the propellant can be safely manipulated or not and thus disposed of immediately due to auto ignition safety concerns.

The propellant stabilizer chromatography demonstration project is developing a field-portable, AC power independent, rugged sample collection and thin layer chromatography (TLC) kit for cost-effective and efficient analysis of large numbers of propellant samples. Development of this equipment, coupled with new procedures, will enable increased efficiencies to be realized through an initial field screening process that rapidly identifies unstable materials for shipping to other sites for further analysis. Sampling and procedural protocols are still being developed and incorporated into this state-of-the-art technology.

Current methods for demilitarization of Navy gun propellant are destructive in nature and are conducted under RCRA regulations. The gun propellant reuse project is designed to provide an alternative use for the excess material. This project has the potential to reduce the cost associated with gun propellant disposal by developing alternative commercial uses. In this case selected propellants are physically processed and loaded into .38 Special, .357 Magnum, .45 ACP, and .40 S&W handgun cartridges. The performance has been compared to equivalent commercial items with favorable results. Other opportunities include 5.56mm

.45 ACP Ammunition Using Recovered Processed Navy Gun Propellant

ammunition and “black Powder” for muzzle loaders and reloaders.

Another commercial product that can be made from military explosives is picric acid. Picric acid, used in the commercial dye industry, can be obtained from the chemical conversion of ammonium picrate (Explosive D). This process, if proven successful, has the potential to eliminate the requirement for open detonation of this insensitive explosive altogether and adverse environmental impacts. The five main operations of the process are bulk explosive D loading, reaction/separation unit, evaporator, crystallizer, and solids handling. While each of these operations have been shown to work independently of the other an integrated system has yet to be fully realized at this time.

Additional similar work is also being pursued that expands the use of this conversion process to other explosive materials like TATB. This expansion is necessary as loss of cost benefit to the government for picric acid has plummeted from $5.00 per pound to a present market rate of approximately $0.50 per pound. TATB is an explosive that is more widely used by the Department of Energy across their weapons program and if TATB can be successfully converted, an overall net gain for the government may yet be realized. Bench scale efforts that use TATB in the conversion process have been successfully completed with promising results now under review.

Sub-scale HMX Recovery Plant

Given the general shortage for TNT materials DoD has been working to offset this concern matter by developing reclamation processes for TNT from excess, and obsolete munitions. These processes have been developed in prior years within the program and have largely focused on the recovery and characterization of HMX explosives from LX-14, PBXN-9 and PBXN-110. The HMX recovered from these explosives has been classified and transported to independent government laboratories for characterization, comparison to virgin material and current production formulations and demonstrations. To date several problems have been encountered and are being addressed. These problems include contamination from prior formulations, crystal morphology, and shape. Development of this process will provide an alternate source for HMX and will reduce the requirement for OB/OD of the munition items that currently contain explosives with the HMX formulation.


Propellant Conversion Pilot Unit at McAlester Army Ammunition Plant

Propellant conversion to fertilizer is an attractive alternative to open burning of this material. The key reactant material in this

conversion process carries the reagent material out in a reaction vessel operating at atmospheric pressure and at a temperature of 160 to 180°F. Following completion of the reaction (between 2 and 4 hours), the product is neutralized with phosphoric acid and is then ready for application as a fertilizer, thus eliminating the need for RCRA regulated treatment technologies. A commercial company is planning to market the resulting product.

Destruction Thrust Area

The destruction thrust area is developing new technologies to replace open burning open detonation of energetic materials that are resultant from other demilitarization processes. Consideration for those materials that are deemed unsuitable for other demilitarization processes are sought whenever further reclamation processes are no longer suitable. Use of the molten salt oxidation system assures complete destruction of energetic material and assists with improved safety and efficiency objectives. To date several hundred pounds of contaminated energetic material have been successfully processed through a pilot scale system. While issues remain that limit the overall effectiveness of this system, key improvements have been realized through new equipment modifications. This system has also successfully processed over 2,000 pounds of propellant thus demonstrating the ability to safely process this type of material in a controlled manner.

Contained Detonation System

Contained detonation chambers are successfully being used at formerly used defense sites and inactive training ranges to treat explosive items where it is unsafe or otherwise not advisable to detonate them in the open. The contained detonation chamber technology is well suited for single munitions items and can safely contain detonations up to 35 pounds. For routine demilitarization use, the quantity detonated per shot must be increased to provide economical feasibility. In addition, improved air pollution control equipment must be developed. Current efforts include redesigning the chamber to accommodate 5 inch/38, 5 inch/54, and 155mm projectiles. Increasing the capacity will provide greater flexibility in replacing open detonation processes.

The project Porphyrin-Mediated Photocatalytic Degradation of Energetic Materials involves the study of porphyrin-mediated photocatalysis of energetic materials. The primary goal of this project is to increase the basic scientific understanding of the process of photogeneration of O_2, protons, and electrons on illumination of porphyrins, and relate this information to a practical procedure for the modification of energetic molecules. Development of this technology may lead to more environmentally benign methods for the destruction of energetic materials and energetic waste streams, thus creating more efficient disposal and treatment methods.

Waste Stream Treatment Thrust Area

Many demilitarization methods generate explosive contaminated waste material as an unavoidable result of the process. The technologies under development in the waste stream treatment thrust area include hot gas decontamination, biodegradation for perchlorate and energetic materials, supercritical water oxidation, and molten salt oxidation. These technologies tend to fill in the voids for which better technology is currently not available, or that are treated by other inefficient means.

Rear and Side View of Hot Gas Decontamination Chamber

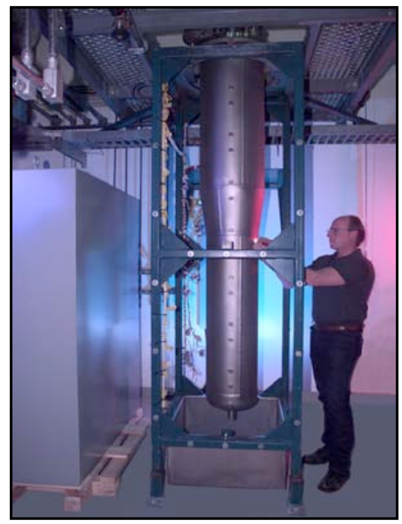
Hot gas decontamination technology addresses the contamination that is left on process equipment, projectiles, or other items, where their useful value would be destroyed by conventional explosive decontamination procedures. One acceptable practice for explosive decontamination includes exposing the item to intense fire for 30 minutes. This warps metal, and burns painted surfaces, leaving a charred mess. It also destroys organics in electric motors, circuit boards, etc., rendering them useless. The use of the Hot Gas Decontamination technology enables the decontamination of explosive contaminated items to be conducted at lower temperatures causing the explosive contamination to sublime (solid to gaseous state) where they are carried by the hot gas stream and destroyed by thermal oxidation. Major prototype process equipment has been designed, fabricated and is on site at Hawthorne Army Depot where it will be installed and demonstrated and validated for specific demilitarized items.

Biodegradation System

The biodegradation system prototype for processing of ammonium perchlorate (AP) contaminated wastewater continues to operate successfully. The wastewater is a direct result of water washout from HC 1.3 solid rocket motors. Today, there is increased concern for this material by environmental regulators and the general public because of its impacts to effect groundwater (above and below ground). This technology addresses the complete destruction of the perchlorate in an environmentally safe manner. Current efforts have addressed process optimization and increased performance using enhanced feed and effluent handling techniques. This has enabled more AP contaminated wastewater to be processed and increased the efficiencies of the washout procedures.

Supercritical water oxidation is applicable to a wide variety of waste streams. The waste stream of concern for the demilitarization program is the TNT-contaminated water from the meltout or washout processes. These waste streams are toxic, difficult to handle, and classified as hazardous waste for purposes of disposal. The supercritical water oxidation process offers a technology that will completely destroy the chemicals of concern, rendering the effluent safe to discharge to the environment. The targeted application is the “pink water” that results from the meltout or washout of explosives, but may also have applications to the “red water” generated as a result of the manufacturing of TNT. Current efforts have focused on extended operation of the system with effluent, both liquid and gaseous, analysis for compliance with federal and state regulations.

The molten salt oxidation system is under development to address energetic waste material generated from the meltout or washout of energetics. The liquid effluent from these operations is currently processed through charcoal filters to remove explosive contamination. This explosive contaminated charcoal must then be treated as a hazardous waste and disposed as such. The molten salt technology is well suited for the controlled treatment of these materials. Extended operation of the system, using explosive contaminated charcoal, was accomplished during the past year. Several engineering problems with the design were identified and fixes were developed. The exhaust gases were monitored during the process to assure compliance with applicable state and federal laws and assist with the operation of the system.



MSO Reactor

3-1. *Investments*

Table 1. Investment Plan FY 2002-2006

(In Thousands of $)

TECHNOLOGY	LEAD	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
DISASSEMBLY						
Automated Munitions Disassembly	Army/Sandia National Lab	1,711	1,500	1,000	750	500
Advanced Cutting – Conversion	Navy/LLNL	550	500	500	500	500
Cryofracture	Army					750
REMOVAL						
Propellant Removal and Processing	Air Force/Thiokol	100	100			
Microwave Applications	Navy					300
Induction Heating	Navy	100	100			
Advanced Removal – Conversion	Army/LLNL	150	100		400	500
RESOURCE / RECOVERY / RECYCLING						
Propellant / Explosive Analyzer and Studies	Army/Lawrence Livermore NL	3,069	2,500	1,500	1,000	650
Recovery/Reuse of Energetics	Navy	2,250	600	1,000	750	
Energetics Conversion to Fertilizer	Army/ARCTEC	300				
Innovative Demilitarization Technology	Army		2,400	1,000	1,000	
Ammo Risk Capability	Army				300	500
Inductively Coupled Plasma Conversion Process	Sandia National Labs				250	250
Advanced Composite Materials Demilitarization	Air Force					300

TECHNOLOGY	LEAD	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
DESTRUCTION						
NTS Demonstration	NTS-JDT Working Group				1,381	3,015
Contained Detonation	Army/Navy/DeMil International	2,200	1,800	552	500	
Mobile Plasma Arc	Army/MSE Technology Application Inc			750	1,000	750
CAD/PAD	Army	260				
Molten Salt Oxidation	Navy	500				
Photocatalytic Degradation	Army/OSU	1,200	2,100			
Rotary Furnace	Army	1,100	2,030			
Metal Processing /Reduction	Army		1,500			
WASTE STREAM TREATMENT						
Hot Gas Decontamination	Army/TVA	1,200	1,200	1,000		
Molten Salt Oxidation	LLNL/Army	500	435	500	500	500
Hydrothermal Oxidation	Air Force/General Atomics	505	500	500	500	500
Biodegradation	Air Force/ARA	30				
SYSTEM INTEGRATION						
System Integration	JOCG Working Group	1,200	1,200	1,200	1,200	1,200
TOTAL		**16,925**	**18,565**	**9,502**	**10,031**	**10,215**

3-2. Technology Applications

Table 2. Technology Applications

TECHNOLOGY	APPLICATION
DISASSEMBLY	
Automated Munitions Disassembly	Submunition - Loaded Munitions, ICM's CBU's in a Flexible Workcell FUDS / Range Cleanup and Depot Environments
Advanced Cutting Conversion	Cased Conventional Munitions Including FUDS / Range Cleanup
Cryofracture	Cargo (Submunitions)-Carrying Munitions/PEP Loaded Items and Mines
REMOVAL	
Propellant Removal and Processing	Tactical and Strategic Rocket Motors
Microwave Applications	Cast Explosive Loaded Bombs (M117 750lbs)
Induction Heating	Small Cast Loaded Explosive Items
Advanced Removal/Conversion	Submunitions, Grenades, Fixed Rounds up to 105mm
RESOURCE/RECOVERY/RECYCLING	
Propellant / Explosive Analyzer and Studies	Propellants and Explosives Analysis and detection
Recovery / Reuse of Energetic	Energetics Containing RDX, HMX, Expl D, Gun Propellant, Pyrotechnics
Energetic Conversion to Fertilizers	Excess or Waste Energetics
Innovative Demilitarization Technology	Submunitions, Pyrotechnics, Smokes
Ammo Risk Capability	Innovative Munitions Toolkit
Inductively Coupled Plasma Conversion Process	Recovered Energetic Materials
Advanced Composite Materials Demilitarization	Weapon Systems Containing Advanced Composite Materials
DESTRUCTION	
NTS Demonstration	Separate Loading Projectile Munitions / Tactical and Strategic Motors
Molten Salt Destruction	Energetic Contaminated Carbon / Sludges
Photocatalysis	Organic Fillers and Explosives
Rotary Furnace	Small Energetic Containing Components
Contained Detonation	30 lbs NEW Maximum, Small Energetic Components, Projectiles
Mobile Plasma Treatment	CADs and PADs
Metal Processing/Reduction	Metal Parts
WASTE STREAM TREATMENT	
Hot Gas Decontamination	Energetic Contaminate Removal System
Hydrothermal Oxidation	Energetics Contaminated Water
Biodegradation	Energetic Contaminated Waste Stream and Sludges
Molten Salt Oxidation	Energetic Contaminated Carbon

4-1. Conclusion

The Joint Demilitarization Technology Program is structured to meet requirements of the current and forecasted stockpile of conventional munitions, explosives, and tactical missiles and rockets. The R&D plan and project demonstrations planned for this program balance technology maturation with disposition needs that address the highest priority needs of the DoD. The result of each project will be transitioned into the government and commercial demilitarization base to enhance safety, efficiency, and environmental acceptability in a manner that complies with all applicable environmental laws. Additionally, the program plan takes advantage of previous program efforts for explosives demilitarization technology R&D and is supportive of enhancing the commercial base. Furthermore, the program plan seeks to leverage existing interservice, interagency, industry, and academia partnerships. The program plan has been developed using an integrated management approach following the model of the Large Rocket Motor Demilitarization Program. It is expected that this will allow the program to evaluate new and continuing requirements, and make adjustments to ensure the Department maintains a coherent technology investment strategy throughout the Future Years Defense Plan. Beginning in FY 2004 the U.S. Army will be required to program and budget for this program. The Army will do so in accordance with guidance and continuing oversight, performed by the Office of the Secretary of Defense, that maintains a joint program perspective and execution strategy.